

Chapter Seven

SCENARIO ANALYSIS

7.1 OVERVIEW

This overview presents findings under a scenario that assumes implementation of the 2020 Virginia Air Transportation System Plan. To provide meaningful comparisons to current conditions, the scenario only pertains to airports that were fully operational in 2001 and estimates the difference between the actual 2001 economic impacts, and impacts of the recommended improvements when assuming 2001 conditions.¹⁹ Per the recommendations given in the System Plan, this scenario examines the economic impacts of implementing:

- Instrument Approach Procedure (IAP) upgrades at 14 airports; and
- Runway extensions at 12 airports, with 5 airports recommended to receive both navigational and runway improvements. (See **Table 7.1.**)

The scenario is described and reported below. The following sections detail methodology for developing the scenario. Subparts of the scenario include analyses of IAP improvements and runway extensions. Lastly, the conclusion presents the scenario in the context of the regional impacts for the 2001 base case.

7.2 SCENARIO

Visitor spending will be affected by both IAP and runway improvements. The recommended IAP upgrades will allow for more operations by allowing takeoffs and landings during a wider range of weather conditions than are now possible. Runway extensions will allow airports to service larger airplanes than can now be accommodated by increasing the size of aircraft that can use these airports.²⁰ Extended runways that allow for larger aircraft will likely lead to an increase of passengers per aircraft as larger airplanes are either substituted for smaller planes or are used in addition to smaller planes. For the 12 airports where runway extensions are recommended, 11 show recommendations to extend their primary runway to 5,500 feet, while the recommendation for Manassas Regional is to extend its primary runway from 5,500 feet to 6,200 feet. Virginia airports slated for runway extensions and IAP improvements under the 2020 Air Transportation System Plan are shown in **Table 7.1.**

¹⁹ Accordingly, impacts of System Plan recommendations for airports programmed to open in future years, Lee and Tappahannock, or the recently opened Stafford airport, which is in its “ramp-up” phase, are not included in this scenario.

²⁰ Longer runways may provide the distance required by larger business jet aircraft or charters to take off while fully loaded or come into compliance with insurance requirements for runway lengths matched for certain types of aircraft.

On-airport sales will also increase due to IAP and runway improvements. The increase in operations assumed from IAP upgrades will generate demand for on-airport FBO related services and other aviation services provided by airport tenants. Further, both IAP and runway improvements will bring more passengers to Virginia airports, resulting in increased sales at retail and food services establishments.

Table 7.1

**IAP and Runway Improvements Recommended in the 2020
Virginia Air Transportation System Plan**

Airport	Improvement	
	IAP	Runway
Accomack	X	
Blue Ridge		X
Chesapeake	X	
Culpeper	X	X
Dinwiddie		X
Farmville	X	X
Front Royal	X	
Hampton Roads	X	X
Hanover	X	X
Leesburg	X	
Lonesome Pine	X	
Louisa		X
Manassas		X
Mecklenburg-Brunswick		X
Middle Peninsula	X	X
Shannon	X	
Tazewell	X	
Virginia Highlands		X
Virginia Tech		X
Warrenton-Fauquier	X	
William Tuck	X	

Results. If the recommended IAP upgrades and runway extensions were in place for the 2001 system wide economic impact analysis, impacts in 2001 based on assumptions made for this scenario show:

- \$14.5 million in additional business sales in the Commonwealth, generating 264 jobs and \$5.5 million in workers wages and salaries.
- A total of \$13 million in regional business sales generated by the 21 airports, including \$5 million in wages, supporting 250 jobs.

- The recommended IAP improvements add nearly \$3.3 million to the regional economies of the 14 designated airports, including on-airport direct sales, off-airport visitor spending, and spin-off (i.e., multiplier) impacts.
 - About \$2.1 million are in additional on-airport sales due to the 12,000 additional operations that the airports will be able to accommodate and about \$1.2 million will be in visitor spending.
 - This economic activity will yield almost \$1.3 million in wages and 54 jobs. Roughly 49 jobs, \$1.1million in wages and \$3 million of business sales will be additional statewide benefits. In this scenario, 2,400 operations (and the resulting impacts for statewide totals) are assumed to be redistributed within Virginia, accounting for state totals being lower than the sum of individual airport impacts.
- The recommended runway expansions would add nearly \$11 million to the regional economies of the 12 designated airports, primarily because longer runways will be able to accommodate larger aircraft that can seat more passengers, increasing the number of visitors to Virginia.²¹ In addition two of the airports house retail tenants and it is likely that sales at these establishments will increase as more passengers use the airports.
 - In this scenario, spending by the additional visitors due to the runway expansions is estimated at \$6.5 million, and will generate an additional \$4.1 million in local area spin-off impacts. Combined, this \$10.6 million includes \$4 million in wages and accounts for over 200 local jobs. Impacts to all of Virginia, including initial visitor spending and the Commonwealth-wide “spin-offs” are \$12.1 million in business sales, \$4.5 in wages and 222 jobs.
 - Retailing at Manassas Regional and Hampton Roads airports are estimated to generate an additional \$180,000 of on-airport sales (\$110,000 at Manassas Regional and \$70,000 at Hampton Roads), generating \$99,000 in local spin-offs and \$138,000 in Virginia wide spin-offs. In total, for Virginia, the increased retail sales will yield \$318,000, producing \$137,000 in wages and eight jobs.

Table 7.2 reports findings detailing how the Virginia Air Transportation System Plan would have affected each airport recommended for improvements had they been in-place for the 2001 system-wide economic impact analysis.

²¹ All visitors are assumed as new to Virginia.

Table 7.2

**Total Economic Benefits Generated from IAP Upgrades and Runway Expansions Recommended in Virginia's
2020 Airport System Plan. (All dollars are in thousands.)**

Airport	Direct On-Airport Impacts			Spin-off Impacts on the Regional Economy			Total Regional Economic Growth		
	Jobs	Wages	Sales	Jobs	Wages	Sales	Jobs	Wages	Sales
Accomack	0	\$ 1	\$ 3	0	\$ 1	\$ 3	0	\$ 2	\$ 6
Blue Ridge	9	\$ 121	\$ 319	3	\$ 79	\$ 231	12	\$ 200	\$ 550
Chesapeake	1	\$ 21	\$ 49	0	\$ 12	\$ 34	1	\$ 33	\$ 83
Culpeper	16	\$ 257	\$ 661	5	\$ 137	\$ 395	21	\$ 393	\$ 1,055
Dinwiddie	13	\$ 185	\$ 480	4	\$ 124	\$ 359	17	\$ 309	\$ 838
Farmville	4	\$ 57	\$ 148	3	\$ 109	\$ 296	7	\$ 165	\$ 445
Front Royal	4	\$ 127	\$ 298	1	\$ 15	\$ 44	4	\$ 142	\$ 342
Hampton Roads	27	\$ 412	\$ 1,043	10	\$ 273	\$ 775	37	\$ 685	\$ 1,817
Hanover	10	\$ 207	\$ 519	8	\$ 213	\$ 624	19	\$ 421	\$ 1,143
Leesburg	6	\$ 157	\$ 364	0	\$ 1	\$ 3	6	\$ 158	\$ 367
Lonesome Pine	0	\$ 3	\$ 7	0	\$ 0	\$ 1	0	\$ 3	\$ 7
Louisa	15	\$ 209	\$ 548	3	\$ 98	\$ 338	18	\$ 307	\$ 885
Manassas	42	\$ 840	\$ 2,085	12	\$ 436	\$ 1,120	54	\$ 1,276	\$ 3,205
Mecklenburg-Brunswick	3	\$ 32	\$ 87	1	\$ 16	\$ 44	4	\$ 48	\$ 131
Middle Peninsula	5	\$ 71	\$ 187	1	\$ 31	\$ 95	6	\$ 102	\$ 282
Shannon	0	\$ 14	\$ 33	0	\$ 0	\$ 1	0	\$ 15	\$ 34
Tazewell	0	\$ 1	\$ 2	3	\$ 18	\$ 53	3	\$ 19	\$ 55
Virginia Highlands	9	\$ 127	\$ 331	3	\$ 79	\$ 224	12	\$ 207	\$ 556
Virginia Tech	16	\$ 209	\$ 550	5	\$ 114	\$ 336	21	\$ 323	\$ 886
Warrenton-Fauquier	3	\$ 42	\$ 100	0	\$ 3	\$ 10	4	\$ 46	\$ 109
William Tuck	0	\$ 7	\$ 16	4	\$ 97	\$ 227	4	\$ 104	\$ 242
Airport and Regional Totals	183	\$ 3,100	\$ 7,829	66	\$ 1,856	\$ 5,211	250	\$ 4,956	\$ 13,039
<i>Additional Impacts to Virginia</i>	<i>181</i>	<i>\$ 3,046</i>	<i>\$ 7,699</i>	<i>83</i>	<i>\$ 2,403</i>	<i>\$ 6,778</i>	<i>264</i>	<i>\$ 5,449</i>	<i>\$ 14,477</i>

7.3 SEGMENTS OF THE SCENARIO

The following subsections provide detail of the methodologies and assumptions used to construct the scenario.

7.3.1 Impacts of Navigational Instrumentation Upgrades

As an element of the scenario, an analysis was conducted for 14 airports to measure the potential impacts of recommended navigational improvements. Assumptions used to develop the scenario are described below.

Additional Operations. This scenario assumes that 12,000 additional operations will occur at airports recommended for IAP upgrades. This total was derived by the following steps:

- Ten years of weather data were examined for each airport. The primary data analyzed was the the percentage of time that weather conditions would allow planes to land if the new recommended approach minimums were in place. This data was compared to current conditions to determine the *incremental* increase in potential operations.
- 2001 GA operations were increased by the percent of additional operations suggested by the weather data. This was done by adding observations of weather conditions where: (1) landings are possible; (2) landing would be possible if the upgrades were in place, and (3) landings would not be possible even if the upgrades were in place. Of this sum, the percent of observations where landings would be possible with the upgrades (#2) were multiplied against GA operations in 2001 to derive estimates of operations gained by the IAP improvements. (See **Table 7.3.**)

Table 7.3

Additional Operations Possible With Recommended IAP Upgrades

Airport	GA Ops Under Existing IAP	Weather Conditions that Allow Additional Landings with Recommended IAP (Percent of observations)	Additional Ops Assumed by Scenario	Operations Assumed by Scenario
Accomack County	9,925	1.2%	121	10,046
Chesapeake Regional	27,882	2.2%	626	28,508
Culpeper County	44,057	2.5%	1,111	45,168
Farmville Regional	9,784	2.2%	218	10,002
Front Royal-Warren County	9,949	12.1%	1,202	11,151
Hampton Roads	56,090	2.3%	1,292	57,382
Hanover County Municipal	27,060	3.5%	936	27,996
Leesburg Executive	85,050	3.0%	2,590	87,640
Lonesome Pine	8,524	3.5%	298	8,822
Middle Peninsula Regional	12,021	2.3%	276	12,297
Shannon	28,400	2.5%	716	29,116
Tazewell County	4,784	1.1%	52	4,836
Warrenton-Fauquier	38,094	5.9%	2,246	40,340
William M. Tuck	7,043	4.0%	281	7,324
Totals	368,663	3.2%	11,965	380,628
Sources: 1993-2002 Count of WX CAT, VATSP Forecasts. Analysis by EDR Group.				

Impacts on the economies of the airport impact regions and the Commonwealth. All impacts are assumed to be new impacts on regions. To estimate statewide impacts, airports were divided into two classifications, discussed below and shown in **Table 4**.

Airports on Virginia's borders with Maryland, West Virginia, Kentucky, Tennessee or North Carolina. At these airports, all impacts are assumed to be additional, new benefits to the Commonwealth's economy; and

- **Airports that do not border a neighboring state.** For impacts of IAP improvements specified at these interior airports, 50 percent are assumed to represent new operations in Virginia and 50 percent are now diverted to other airports in the Commonwealth, and therefore do not represent additional impacts in Virginia (although they are counted as additional impacts for the airport-specific region within Virginia).

Table 7.4

Location of 14 VA Airports Recommended for IAP Upgrades

Border Airports		Interior Airports
Accomack	Lonesome Pine	Culpeper
Chesapeake	Shannon	Farmville
Front Royal	Tazewell	Hanover
Hampton Roads	William Tuck	Middle Peninsula
Leesburg		Warrenton-Faquier

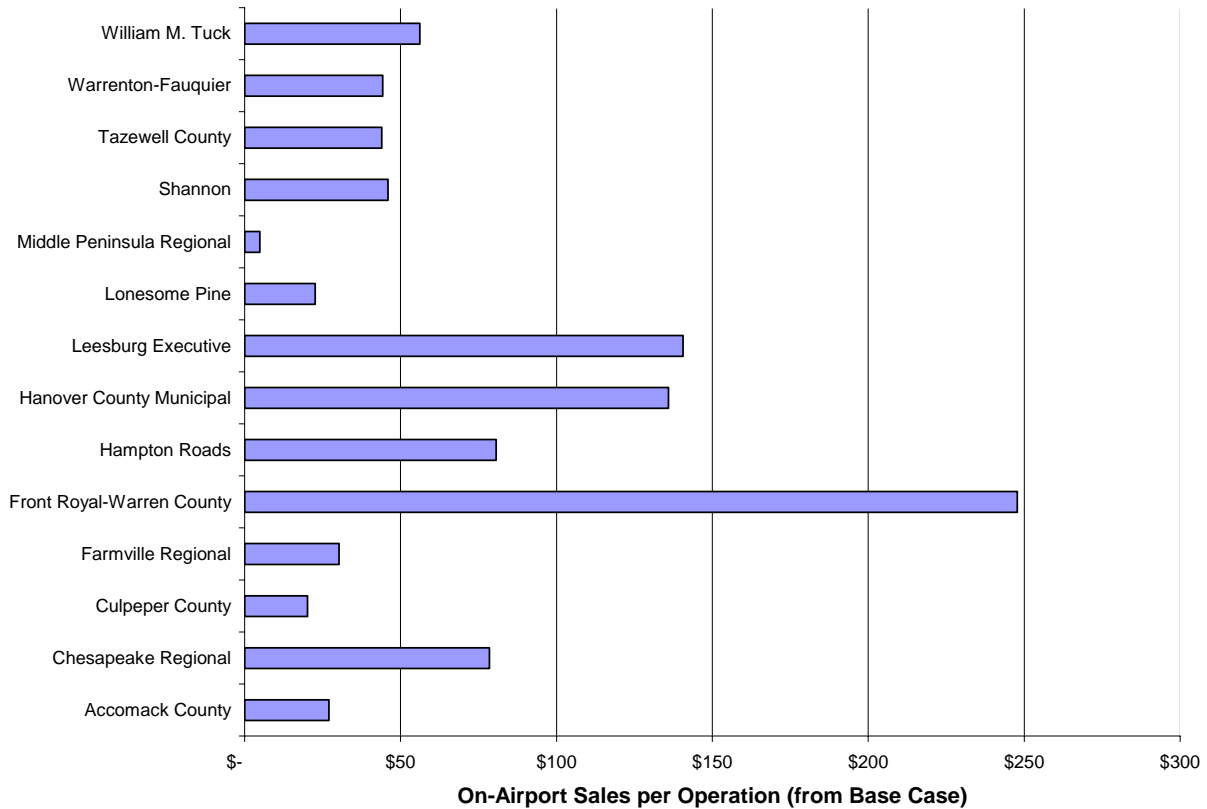
Increase of on-airport sales. Increased operations at airports will increase on-airport sales. Additional airplanes will require parking, fuel, repair and maintenance services in addition to those already provided. Moreover, pilots and passengers on these operations will make purchases at airport concessions and from tenants. To estimate on-airport impacts, revenues of FBOs and tenants that provide aviation services, retailing and food services were calculated on a per-operation basis,²² and this ratio was applied to the additional operations assumed if the recommended IAP upgrades were in place.

Sales per operations vary from \$5 at Middle Peninsula to \$248 at Front Royal. Leesburg and Hanover airports also generate more than \$100 of sales per operation, while Accomack, Culpeper, Farmville and Lonesome Pine, in addition to Middle Peninsula, generate sales of \$30 or less. The spread of sales per operation is illustrated in **Figure 7-1** below.

²² Calculations included airport management, FBOs and tenants.

Figure 7-1

FBO and Tenant Sales of Air Services, Retail and Food Services per Operation at Airports Recommended for IAP Upgrades



The economic impacts from the additional operations expected from the IAP improvements are estimated at:

- \$1.1 million in direct sales;
- 33 jobs among the airport regions and \$833,000 in wages generated from direct sales and spin-off impacts in local economies; and
- \$1.9 million of new statewide benefits including 29 jobs and \$716,000 in workers wages.

Table 7.5 shows the direct impact on each airport with a recommended IAP upgrade, and the spin-off impacts on the impact region of each airport.

Table 7.5

Regional Impacts From Additional On-Airport Activity (All dollars are in thousands)

Airport	Direct On-Airport Impacts			Spin-off Impacts on the Regional Economy			Total Regional Economic Growth		
	Jobs	Wages	Sales	Jobs	Wages	Sales	Jobs	Wages	Sales
Accomack County	0	\$1	\$3	0	\$1	\$3	0	\$2	\$6
Chesapeake Regional	1	\$21	\$49	0	\$12	\$34	1	\$33	\$83
Culpeper County	1	\$9	\$22	0	\$4	\$12	1	\$13	\$34
Farmville Regional	0	\$3	\$7	2	\$74	\$202	2	\$77	\$209
Front Royal-Warren County	4	\$127	\$298	1	\$15	\$44	4	\$142	\$342
Hampton Roads	1	\$45	\$104	1	\$30	\$89	2	\$75	\$193
Hanover County Municipal	1	\$54	\$127	4	\$91	\$276	6	\$146	\$404
Leesburg Executive	6	\$157	\$364	0	\$1	\$3	6	\$158	\$367
Lonesome Pine	0	\$3	\$7	0	\$0	\$1	0	\$3	\$7
Middle Peninsula Regional	0	\$1	\$1	0	\$3	\$7	0	\$3	\$8
Shannon	0	\$14	\$33	0	\$0	\$1	0	\$15	\$34
Tazewell County	0	\$1	\$2	3	\$18	\$53	3	\$19	\$55
Warrenton-Fauquier	3	\$42	\$100	0	\$3	\$10	4	\$46	\$109
William M. Tuck	0	\$7	\$16	4	\$97	\$227	4	\$104	\$242
Totals of Airport Regional Impacts	18	\$484	\$1,133	15	\$349	\$960	33	\$833	\$2,094
Additional Impacts to Virginia	15	\$430	\$1,004	14	\$286	\$856	29	\$716	\$1,860

7.3.2 Impacts of Runway Extensions

This part of the scenario analysis provides details and assumptions made concerning the impacts of extending the primary runway of 11 airports to 5,500 feet and Manassas Regional Airport from 5,700 to 6,200 feet, as recommended under the 2020 Virginia Air Transportation System Plan. Assumptions for constructing the analysis are described below.

Adjusting the average passengers per GA operation to 4 for each of the 12 airports. Longer runways will allow for additional, larger planes, which can carry more passengers. Using four passengers per plane is justified by survey data of larger airports.²³ Ten of the 12 airports recommended for runway lengthening are classified as general reliever airports and two, Louisa County and Virginia Tech/Montgomery Executive, are classified as GA Community airports. Survey data for reliever airports puts the average number of passengers per GA operation at 3.25, so the assumption of 4 passengers represents an increase of 0.75 persons per operation. Visitor impacts of community airports were calculated at an average of 2 passengers per GA operation, following consultations with the Commonwealth's Department of Aviation and based on the current runway and observed aircraft profile. Under this scenario, the number of passengers per aircraft is doubled to four. **Figure 7-2**, below, illustrates the distribution among airports of the

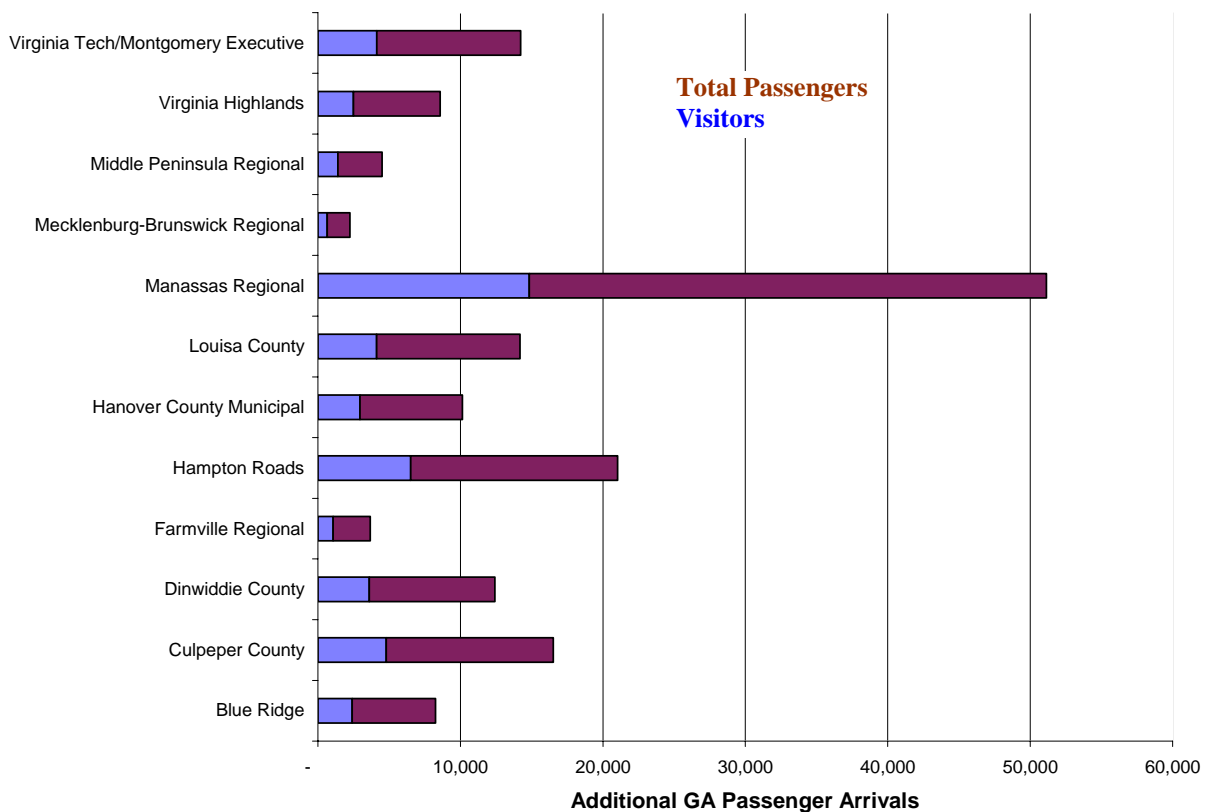
²³ 42 survey responses for airports with primary runways of 5500 feet show an average of 4.17 passengers per GA operation. These results include commercial airports as well as GA only airports.

estimated additional passengers and additional visitors that would be accommodated by the recommended runway lengthenings. In summary:

- With the assumption of 4 passengers per GA operation, the 12 airports recommended for runway expansions would accommodate 167,000 additional passengers, of which 49,000 would be visitors.²⁴
- The primary beneficiary under this scenario is Manassas Regional Airport, which is expected to receive 14,800 of the new visitors or over 30 percent of the total; the second largest increase would be at Hampton Roads Airport with 6,500 additional visitors.
- Mecklenburg-Brunswick Regional Airport shows the lowest projected increase of visitors at 651, followed by Farmville and Middle Peninsula airports with 1,000 and 1,400, respectively.

Figure 7-2

Additional GA Passengers and Visitors with Runway Extensions Recommended by the Air Transportation System Plan (Based on 2001 Data)



The 49,000 additional visitors will generate an average of roughly \$247 per person, including spin-off affects in the Commonwealth, as summarized below:

²⁴ Total operations at the airport would serve 334,000, of which half (167,000) are assumed to be arrivals and half are assumed to be departures. This scenario uses the same assumptions as in the 2001 Virginia Air Transportation System Plan regarding the percentage of itinerant versus local GA operations.

- The additional 49,000 visitors shows additional visitor spending in Virginia of \$6.5 million, generating an additional \$5.6 million in spin-off business sales statewide.
- Commonwealth-wide, the total of \$12.1 of business sales supports for 222 jobs and \$4.5 million in additional wages.

Of these statewide numbers, initial visitor spending and the sum of regional spin-off impacts account for \$10.6 million of business sales, almost \$4 million in wages and 211 jobs.

Increasing sales at airports to account for additional passengers. Two airports, Manassas Regional and Hampton Roads reported retail tenants (none of the airports targeted for runway extensions reported food services). In this scenario, the ratio of retail sales per total GA passenger in 2001 is applied to the presumed additional passengers made possible by the expansions of these airports' primary runways. In total:

- Additional on-airport direct sales are estimated at \$180,000, producing \$88,000 in wages and 5 jobs.
- Virginia-wide impacts, including spin-off affects, are \$318,000 in sales, that in turn generate 8 jobs and \$137,000 in wages.

The projected increase in on-airport retail sales at Manassas Regional Airport and Hampton Roads Airport total \$180,000 in direct sales, supporting \$88,000 in additional wages and 5 jobs. With the impact of regional spin-offs, total localized impacts are estimated to be \$279,000 in business sales, of which \$124,000 are workers wages, accounting for 6 additional jobs. By airport:

- Direct and regional spin-off impacts generated at Manassas Regional are 2 new jobs, \$74,000 in wages and \$162,000 of business activity.
- Direct and regional spin-off impacts generated at Hampton Roads are 4 jobs, \$50,000 in wages and \$117,000 of business activity.

Table 7.6, below, shows the estimated economic benefits associated with the runway lengthenings recommended in the 2020 Virginia Air Transportation System Plan.

Table 7.6

Regional and Commonwealth Economic Benefits From Implementing Runway Expansions Recommended in the 2020 Air System Plan (All dollars are in thousands)

Airport	Initial Visitor Spending and On-Airport Retail			Spin-offs Affects			Total Economic Benefit		
	Jobs	Wages	Sales	Jobs	Wages	Sales	Jobs	Wages	Sales
Blue Ridge	9	\$121	\$319	3	\$79	\$231	12	200	550
Culpeper County	15	\$248	\$638	5	\$133	\$383	20	381	1,021
Dinwiddie County	13	\$185	\$480	4	\$124	\$359	17	309	838
Farmville Regional	4	\$54	\$142	1	\$34	\$94	5	88	236
Hampton Roads	26	\$368	\$938	9	\$243	\$686	35	611	1,624
Hanover County Municipal	9	\$153	\$392	4	\$122	\$347	13	275	739
Louisa County	15	\$209	\$548	3	\$98	\$338	18	307	885
Manassas Regional	42	\$840	\$2,085	12	\$436	\$1,120	54	1,276	3,205
Mecklenburg-Brunswick Regional	3	\$32	\$87	1	\$16	\$44	4	48	131
Middle Peninsula Regional	5	\$70	\$186	1	\$28	\$88	6	99	275
Virginia Highlands	9	\$127	\$331	3	\$79	\$224	12	207	556
Virginia Tech/Montgomery Executive	16	\$209	\$550	5	\$114	\$336	21	323	886
Totals of Airports	166	2,616	6,695	51	1,507	4,250	217	4,123	10,946
Statewide Impacts	166	2,616	6,695	69	\$2,117	\$5,922	235	4,733	12,618

Based on 2001 Airport Analysis.

Manassas Regional Airport and Hampton Roads totals include estimated on-airport retail.

7.4 CONCLUSION

The IAP and runway improvements would have increased overall business sales for the regional economies of the 21 airports by an aggregate 7 percent.²⁵ Given the assumptions made in this scenario, estimates for 11 airports show increases more than 10 percent above the airport regions base case totals and the increase of 10 airports is less than 10 percent. **Figure 7-3** illustrates the relationship by airport between the base case regional economic impacts (business sales) calculated as part of the 2001 system-wide study and the business sales this scenario estimates will be generated by the 2020 Air Transportation System Plan.

The airport showing the greatest percentage increase is Virginia Tech/Montgomery Executive, with an increase of 42 percent above its regional total in the base case. Virginia Tech is one of the two community airports where the assumed number of passengers per GA operation doubled from two to four. Farmville Regional Airport has the second largest increase at 29 percent, followed by Louisa County Airport – another GA - Community airport – at 23 percent. At the

²⁵ This is the sum of on-airport direct spending, initial visitor spending, and spin-off impacts.

other end of the spectrum, Shannon, Accomack and Lonesome Pine airports each show estimated increases of less than 1 percent above the airports' regional base case.

Of the 11 airports where estimated regional impacts above the base case exceed 10 percent:

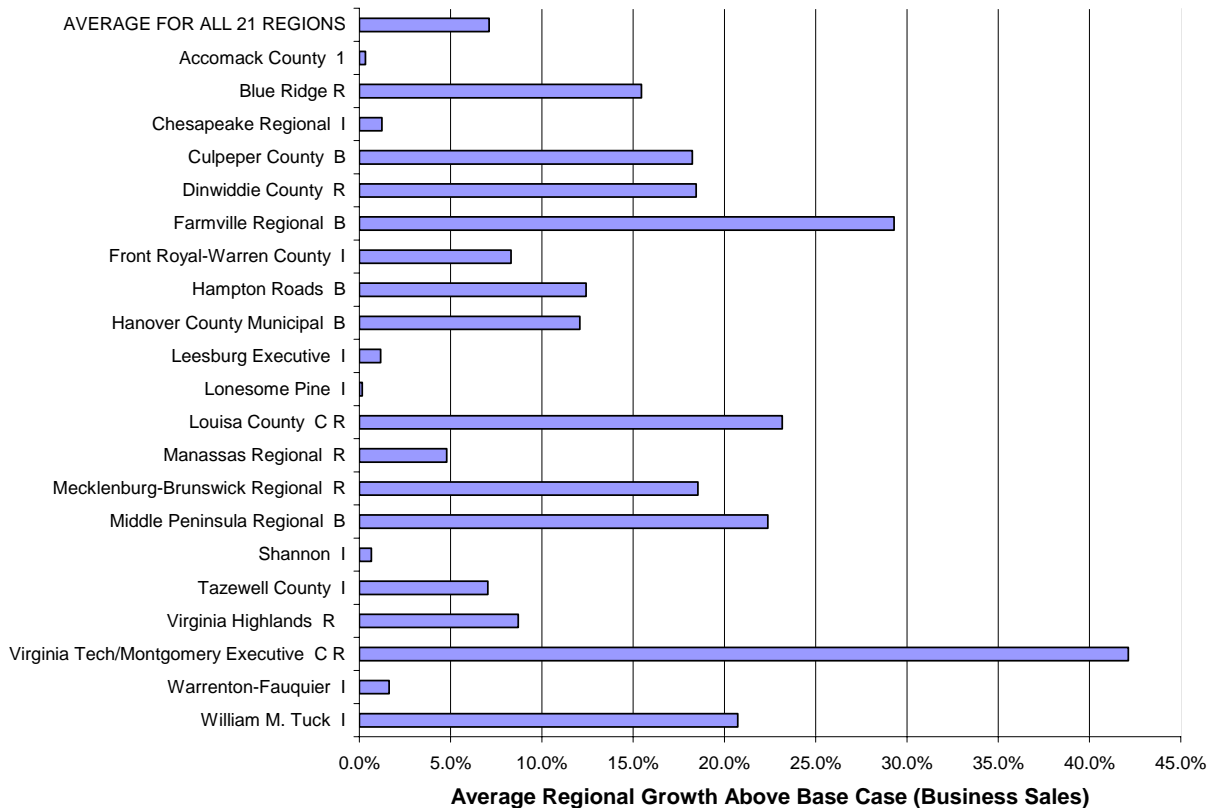
- Two are GA - Community airports that are recommended in the Virginia System Plan for runway expansions to 5,500 feet;
- Five are recommended for both runway expansions and navigational improvements;
- Three are recommended for runway expansions only; and
- One is recommended for only an IAP upgrade.

Of the 10 airports that show regional impacts less than 10 percent of the regional base case:

- Two are recommended for runway expansions; and
- Eight are recommended for IAP upgrades.

Figure 7-3

Percent Increase Above Base Case of Regional Business Sales Generated by Recommended Navigational and Runway Improvements (Based on 2001 Data).



Key: C – Designated GA-Community airport; B – Recommended for both IAP upgrades and runway improvements; R – Recommended for Runway Improvements; and I – Recommended for IAP upgrades.